

What is claimed is:

1. A method of fabricating a contact of a semiconductor device,
comprising:
 patterning an interlayer dielectric of the semiconductor device to form a
5 contact hole that exposes a silicon-based region of a first impurity type;
 doping the exposed silicon-based region with a gas containing an element of
the first impurity type; and
 forming a contact plug in the contact hole.
- 10 2. The method of Claim 1, wherein the first impurity type is an n-type.
3. The method of Claim 1, wherein the gas containing an element of the
first impurity type comprises AsH₃ and/or PH₃.
- 15 4. The method of Claim 1, wherein the contact plug comprises doped
polysilicon.
5. The method of Claim 4, wherein the doped polysilicon is doped with
an element of the first impurity type.
- 20 6. The method of Claim 5, wherein the element of the first impurity type
comprises phosphorus and/or arsenic.
7. The method of Claim 1, wherein doping the exposed silicon-based
25 region with a gas containing an element of the first impurity type and forming a
contact plug in the contact hole are performed in a chamber of the same
manufacturing apparatus in-situ.
8. The method of Claim 3, wherein doping the exposed silicon-based
30 region with a gas containing an element of the first impurity type is performed at a
temperature of from about 400 to about 800 °C.

9. The method of Claim 3, wherein doping the exposed silicon-based region with a gas containing an element of the first impurity type is performed under a chamber pressure of from about 6×10^{-2} to about 6×10^{-4} Torr.
- 5 10. The method of Claim 3, wherein doping the exposed silicon-based region with a gas containing an element of the first impurity type is performed for from about 30 to about 180 seconds.
- 10 11. The method of Claim 1, wherein the silicon-based region comprises a region of a silicon substrate doped with the first impurity type.
12. The method of Claim 1, wherein the silicon-based region comprises a contact plug.
- 15 13. The method of Claim 1, wherein the silicon-based region comprises a polysilicon contact plug doped with the first impurity type.
14. The method of Claim 1, further comprising:
forming a diffusion layer of the first impurity type in a semiconductor
20 substrate of a second impurity type;
depositing an interlayer dielectric on a surface of the semiconductor substrate where the diffusion layer of the first impurity type is formed; and
wherein patterning an interlayer dielectric of the semiconductor device to form a contact hole that exposes a silicon-based region of a first impurity type comprises
25 patterning the interlayer dielectric to form a contact hole that exposes the diffusion layer of the first impurity type as the exposed silicon-based region.
15. The method of Claim 1, further comprising:
forming a diffusion layer of the first impurity type in a semiconductor
30 substrate of a second impurity type;
depositing a first interlayer dielectric on a surface of the semiconductor substrate where the diffusion layer of the first impurity type is formed;
forming a first contact hole in the first interlayer dielectric to expose the diffusion layer of the first impurity type;

forming a first contact plug in the first contact hole using a doped polysilicon;
depositing a second interlayer dielectric on a surface of the semiconductor
substrate where the first contact plug is formed;

5 wherein patterning an interlayer dielectric of the semiconductor device to form
a contact hole that exposes a silicon-based region of a first impurity type comprises
patterning the second interlayer dielectric to form a second contact hole that exposes
the first contact plug as the exposed silicon-based region.

16. A contact structure for a semiconductor device, comprising:
10 an interlayer dielectric of the semiconductor device having a contact hole
formed therein that exposes a silicon-based region of a first impurity type;
a delta-doped region of the first impurity type in the exposed silicon-based
region; and
a contact plug in the contact hole and on the delta-doped region.

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17. The contact structure of Claim 16, wherein the silicon-based region
comprises a diffusion region of the first impurity type in a substrate of a second
impurity type.

18. The contact structure of Claim 17, wherein the diffusion region
comprises a single crystal silicon region and wherein the contact plug comprises
doped polysilicon.

19. The contact structure of Claim 16, further comprising:
25 a first interlayer dielectric having a first contact plug therein;
wherein the interlayer dielectric of the semiconductor device having a contact
plug formed therein comprises a second interlayer dielectric;
wherein a contact plug in the contact hole and on the delta-doped region
comprises a second contact plug; and
30 wherein the silicon-based region comprises the first contact plug in the first
interlayer dielectric.

20. The contact structure of Claim 1, wherein the first contact plug and the
second contact plug comprise doped polysilicon.